# Internship Report on

# Expansion of Wi-Fi Network

# Supported by

# Information Technology Division

# Of

# Fiber optic network solutions Bangladesh limited


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# Declaration

I hereby declare that this internship report is the outcome of my own Work. Requisite references are quoted to support my work. I also declare that this internship report, neither in whole nor in part, has been previously submitted anywhere else for any degree.

_____

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# SUPERVISIOR'S CERTIFICATION

This is to certify that Md. Shawkat Hosen, ID: 2012-2-55-025, Department of Electronics and Communication Engineering, East west university, has done this internship report on deployment of Wi-Fi Network project of IT under technology Division of FONS BD LTD. AS partial requirement of B.Sc in ETE degree. To the best of my knowledge, this report is original in nature and has been prepared by his guidance and was nowhere submitted for any purpose.

Signature:

Mr. Sarwar Jahan

Senior Lecturer

Electronics and Communication Engineering

East West University

Date:

# Acknowledgement

At first I want to express my immense gratefulness and humbleness to all mighty Allah for his kindness and sympathy to me for the successful completion of Undergraduate internship work. Then I would like to thank my parents for their unconditional love and support.

I also, like to thank Mr. Sarwar Jahan Senior Lecturer, Department of ECE, and East West University, Bangladesh. Without his guidance, continuous advice and encouragement this internship may not be accomplished.

I would like to thank Md. Jahirul Islam, Solution Engineer, FONS Bangladesh ltd, for his Kindness cooperation and guidance during the internship period.

# Abstract

This internship report is predominantly representing the off loading procedure based on Wi-Fi Network Deployment. The main purpose of this report is to get practical experience by observing Wi-Fi access network at FONS Bangladesh ltd and Deploying new Wi-Fi network in different organization.

Working with a vendor like RACKUS Wireless have given me adequate knowledge about how to survey a site, what could be the proper solution for a deployment of new Wi-Fi network and the way how to configure an access point, Switches, Router and how to up a Network.

From these three months of internship at FONS Bangladesh ltd I get to understand about the practical working environment in a vendor

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# Chapter 1

# Working Procedure and Standard of Wi-Fi

## *1. 1 Introduction:*

**Wi-Fi** is a local area wireless computer networking technology that allows electronic devices to connect to the network, mainly using the 2.4 gigahertz **UHF** and 5 gigahertz **SHF** ISM radio bands.

Introduced by the Wi-Fi Alliance in early 2007, the program provides an industry-wide Set of network setup solutions for homes and small office (SOHO) environments. Wi-Fi System enables typical users who possess little understanding of traditional Wi-Fi Configuration and security settings to automatically configure new wireless networks add new devices and enable security. More than 200 products have been Wi-Fi CERTIFIED for Wi-Fi Protected Setup since the program was launched in January 2007.

RUCKUS Wireless is one of the well known vendors. They produce Wi-Fi access point (AP) controller. **Wi-Fi** is a local area wireless computer networking technology that allows Working with this vendor was a vast experience; easy to configure and use of these devices. Throughout the total time period of the internship I have visited different site where Wi-Fi network have to developed, assign solution for the Wi-Fi network and worked with RUCKUS Wireless, configuring and deployed those devices in different organization like Hotel sea pearl, Bangladesh Agricultural University, Mongla Port, Chittagong university etc.

## *1.2 History of WI-FI:*

There was a time when if you wanted to get on the Internet your only option was to have a phone cable or Ethernet cable plugged directly into your computer or laptop. Today, you have the option of sitting in any room in your house cord-free or even hopping down to your local coffee shop and surfing the Web with relative ease.

| Year | Details |
|---|---|
| 1990 | Formation of IEEE 802.11 Working Group to define standards for Wireless Local Area Networks (WLANs). |
| 1997 | Release of IEEE 802.11 WLAN protocol, supporting 1-2 Mbit/s data rates in the 2.4 GHz ISM band |
| 1999 | Release of IEEE 802.11b WLAN protocol, supporting 1-11 Mbit/s data rates in the 2.4 GHz ISM band. |
| Year | Details |
| 1999 | Release of IEEE 802.11g WLAN protocol, supporting 1-54 Mbit/s data rates in the 2.4 GHz ISM band |
| 2003 | Release of IEEE 802.11 WLAN protocol, supporting 1-2 Mbit/s data rates in the 2.4 GHz ISM band |
| 2009 | Release of IEEE 802.11b WLAN protocol, supporting 1-11 Mbit/s data rates in the 2.4 GHz ISM band. |

## *1.3 What Is Wi-Fi:*

Wireless Technology is an alternative to Wired Technology, which is commonly used, for connecting devices in wireless mode. Wi-Fi (Wireless Fidelity) is a generic term that refers to the IEEE 802.11 communications standard for Wireless Local Area Networks (WLANs). Wi-Fi Network connects computers to each other, to the internet and to the wired network. Wi-Fi works on physical and data link layer. It describes network components that are based on one of the 802.11 standards developed by the IEEE and adopted by the Wi-Fi Alliance.

Examples of Wi-Fi standards, in chronological order, include:

- 802.11a
- 802.11b
- 802.11g
- 802.11n
- 802.11ac

## *1.4 The Basic Concept Of How Wi-Fi Works:*

Basic concept is same as Walkie talkies. A Wi-Fi hotspot is created by installing an access point to an internet connection. An access point acts as a base station. When Wi-Fi enabled device encounters a hotspot the device can then connect to that network wirelessly. A single access point can support up to 30 users and can function within a range of 100 up to 300 feet. Many access points can be connected to each other via Ethernet cables to create a single large network.

A wireless network or Wi-Fi Network usually transmits at a frequency level of 2.4 GHz or 5 GHz to adapt to the amount of data that is being sent by the user. The 802.11 networking standards will somewhat vary depending mostly on the user's needs as explained below:

**1.** The 802.11a transmit data-at a frequency level- of 5GHz. The Orthogonal Frequency-Division Multiplexing (OFDM) used enhances reception by dividing the radio signals into smaller signals before reaching the router. A user can transmit a maximum of 54 Mbits of data per second.

**2.** The 802.11b transmit data at a frequency level of2.40Hz, which is a relatively slow speed. You can transmit a maximum of 11 Mbits of data per second.

**3.** The 802.11g transmit data at 2.40Hz but can transmit a maximum of 54 Mbits of data per second as it also uses an OFDM coding.

**4.** The more advanced 802.11n can transmit a maximum of 140 megabits of data per second and uses a frequency level of 5GHz

## *1.5 Wi-Fi Standard:*

The 802.11 family consists of a series of half-duplex over-the-air modulation techniques that use the same basic protocol. 802.11-1997 was the first wireless networking standard in the family, but 802.11b was the first widely accepted one, followed by 802.11a, 802.11g, 802.11n, and 802.11ac. Other standards in the family (c–f, h, j) are service amendments that are used to extend the current scope of the existing standard, which may also include corrections to a previous specification.

### *1.5.1 IEEE 802.11:*

The original version of the standard IEEE 802.11 was released in 1997 and clarified in 1999, but is today obsolete. It specified two net bit rates of 1 or 2 megabit per second (Mbit/s), plus forward error correction code. It specified three alternative physical layer technologies: diffuse infrared operating at 1 Mbit/s; frequency-hopping spread spectrum operating at 1 Mbit/s or 2 Mbit/s; and direct-sequence spread spectrum operating at 1 Mbit/s or 2 Mbit/s. The latter two radio technologies used microwave transmission over the Industrial Scientific Medical frequency band at 2.4 GHz.

### *1.5.2 IEEE 802.11a:*

Originally described as clause 17 of the 1999 specification, the OFDM waveform at 5.8 GHz is now defined in clause 18 of the 2012 specification, and provides protocols that allow transmission and reception of data at rates of 1.5 to 54 Mbit/s. It has seen widespread worldwide

implementation, particularly within the corporate workspace. While the original amendment is no longer valid, the term "802.11a" is still used by wireless access point (cards and routers) manufacturers to describe interoperability of their systems at 5.8 GHz, 54 Mbit/s.The 802.11a standard uses the same data link layer protocol and frame format as the original standard, but an OFDM based air interface (physical layer). It operates in the 5 GHz band with a maximum net data rate of 54 Mbit/s, plus error correction code, which yields realistic net achievable throughput in the mid-20 Mbit/s. Since the 2.4 GHz band is heavily used to the point of being crowded, using the relatively unused 5 GHz band gives 802.11a a significant advantage. However, this high carrier frequency also brings a disadvantage: the effective overall range of 802.11a is less than that of 802.11b/g. In theory, 802.11a signals are absorbed more readily by walls and other solid objects in their path due to their smaller wavelength, and, as a result, cannot penetrate as far as those of 802.11b. In practice, 802.11b typically has a higher range at low speeds (802.11b will reduce speed to 5.5 Mbit/s or even 1 Mbit/s at low signal strengths). 802.11a also suffers from interference, but locally there may be fewer signals to interfere with, resulting in less interference and better throughput.

| **Parameter** | **Value** |
|---|---|
| **Date of standard approval** | July 1999 |
| **Maximum data rate (Mbps)** | 54 |
| **Typical data rate (Mbps)** | 25 |
| **Typical range indoors (Meters)** | ~30 |
| **Modulation** | OFDM |

**Table 1: Summary of802.11b Wi-Fi Standard Specification**

## *1.5.3 IEEE 802.11b:*

The 802.11b standard has a maximum raw data rate of 11 Mbit/s, and uses the same media access method defined in the original standard. 802.11b products appeared on the market in early 2000, since 802.11b is a direct extension of the modulation technique defined in the original standard. The dramatic increase in throughput of 802.11b (compared to the original

standard) along with simultaneous substantial price reductions led to the rapid acceptance of 802.11b as the definitive wireless LAN technology.

Devices using 802.11b experience interference from other products operating in the 2.4 GHz band. Devices operating in the 2.4 GHz range include microwave ovens, Bluetooth devices, baby monitors, cordless telephones, and some amateur radio equipment.

| **Parameter** | **Value** |
|---|---|
| **Date of standard approval** | July 1999 |
| **Maximum data rate (Mbps)** | 11 |
| **Typical data rate (Mbps)** | 5 |
| **Typical range indoors (Meters)** | ~30 |
| **Modulation** | CCK (DSSS) |
| **RF Band (GHz)** | 2.4 |
| **Channel width (MHz)** | 20 |

**Table 2: Summary of 802.11b Wi-Fi Standard Specification**

## *1.5.4 IEEE 802.11g:*

In June 2003, a third modulation standard was ratified: 802.11g. This works in the 2.4 GHz band (like 802.11b), but uses the same OFDM based transmission scheme as 802.11a. It operates at a maximum physical layer bit rate of 54 Mbit/s exclusive of forward error correction codes, or about 22 Mbit/s average throughputs.[ 802.11g hardware is fully backward compatible with 802.11b hardware, and therefore is encumbered with legacy issues that reduce throughput by ~21% when compared to 802.11a.

The then-proposed 802.11g standard was rapidly adopted in the market starting in January 2003, well before ratification, due to the desire for higher data rates as well as to reductions in manufacturing costs. By summer 2003, most dual-band 802.11a/b products became dual-band/tri-mode, supporting a and b/g in a single mobile adapter card or access point. Details of making b and g work well together occupied much of the lingering technical process; in an 802.11g network, however, activity of an 802.11b participant will reduce the data rate of the overall 802.11g network.

Like 802.11b, 802.11g devices suffer interference from other products operating in the 2.4 GHz band, for example wireless keyboards.

| **Parameter** | **Value** |
|---|---|
| **Date of standard approval** | June 2003 |
| **Maximum data rate (Mbps)** | 54 |
| **Modulation** | CCK, DSSS, or OFDM |
| **RF Band (GHz)** | 2.4 |
| **Channel width (MHz)** | 20 |

**Table 3: Summary of 802.11g Wi-Fi Standard Specification**

## *1.5.5 IEEE802.11n:*

802.11n is an amendment that improves upon the previous 802.11 standards by adding multiple-input multiple-output antennas (MIMO). 802.11n operates on both the 2.4 GHz and the lesser-used 5 GHz bands. Support for 5 GHz bands is optional. It operates at a maximum net data rate from 54 Mbit/s to 600 Mbit/s. The IEEE has approved the amendment, and it was published in October 2009. Prior to the final ratification, enterprises was already migrating to 802.11n networks based on the Wi-Fi Alliance's certification of products conforming to a 2007 draft of the 802.11n proposal.

| Parameter | Value |
|---|---|
| **Maximum data rate (Mbps)** | 600 |
| **RF Band (GHz)** | 2.4 or 5 |
| **Modulation** | CCK, DSSS, or OFDM |
| **Number of spatial streams** | 1, 2, 3, or 4 |
| **Channel width (MHz)** | 20, or 40 |

**Table 4: Summary 802.11n Wi-Fi Standard**

## 1.5.6 IEEE802.11ac:

IEEE 802.11ac-2013 is an amendment to IEEE 802.11, published in December 2013 that builds on 802.11n. Changes compared to 802.11n include wider channels (80 or 160 MHz versus 40 MHz) in the 5 GHz band, more spatial streams (up to eight versus four), higher-order modulation (up to 256-QAM vs. 64-QAM), and the addition of Multi-user MIMO (MU-MIMO). As of October 2013, high-end implementations support 80 MHz channels, three spatial streams, and 256-QAM, yielding a data rate of up to 433.3 Mbit/s per spatial stream, 1300 Mbit/s total, in 80 MHz channels in the 5 GHz band. Vendors have announced plans to release so-called "Wave 2" devices with support for 160 MHz channels, four spatial streams, and MU-MIMO in 2014 and 2015.

| Parameter | Value |
|---|---|
| Frequency band | 5.8 GHz ISM (unlicensed) band |
| Max data rate | 6.93 Gbps |
| Transmission bandwidth | 20, 40, & 80 MHz<br>160 & 80 + 80 MHz optional |
| Modulation formats | BPSK, QPSK, 16-QAM, 64-QAM<br>256-QAM optional |

| | |
|---|---|
| FEC coding | Convolution or LPDC (optional) with coding rates of 1/2, 2/3, 3/4, or 5/6 |
| MIMO | Both single and multi-user MIMO with up to 8 spatial streams. |
| Beam-forming | Optional |

**Table 5: Summary of 802.11ac Wi-Fi Standard Specification**

## *1.6 Working Procedure of Wi-Fi:*

A wireless network or Wireless Local Area Network (WLAN) serves the same purpose as a wired one — to link a group of computers. Because "wireless" doesn't require costly wiring, the main benefit is that it's generally easier, faster and cheaper to set up.

Wireless networks operate using radio frequency (RF) technology, a frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space.


**Fig 1: Wi-Fi Working-Concepts**

The cornerstone of a wireless network is a device known as an access point (AP). The primary job of an access point is to broadcast a wireless signal that computers can detect and "tune" into. Since wireless networks are usually connected to wired ones, an access point also often serves as a link to the resources available on the a wired network, such as an Internet connection.

In order to connect to an access point and join a wireless network, computers must be equipped with wireless network adapters. These are often built right into the computer, but if not, just about any computer or notebook can be made wireless-capable through the use of an add-on adapter plugged into an empty expansion slot, USB port, or in the case of notebooks, a PC Card slot.

# Chapter 2

# Devices used for Wi-Fi Network

## *2.1 Devices of 'RUCKUS WIRELESS':*

Devices of "RUCKUS wireless“that are used during the internship period are Access point

1. Zone-Flex Indoor Access Points.
   • Zone-Flex 7363 (Indoor)
   • Zone-Flex 7321 (Indoor)
2. Zone-Flex outdoor Access Points.
   • Zone-Flex 7762 (Outdoor)

## *2.2 Zone-Flex Indoor Access Points:*

Ultra-fast and Reliable Smart Wi-Fi Access Points with Adaptive Antenna Technology In the world of wireless LANs (WLANs), power and simplicity are like oil and water, they've just never mixed until now. Our Ruckus WLAN systems bring power and simplicity together for large-scale indoor deployments along with all the requisite capabilities demanded:

- Seamless interoperability
- Advanced Wi-Fi security
- Massive scalability
- Best-in-class performance
- Robust WLAN management

## *2.3 Zone-Flex 7363:*

The Zone Flex 7363 is a dual band product. Maximum 802.11n capacity makes the Zone Flex 7363 one of the industry's lowest cost, highest performing line of 802.11 n mid-range access

points available. The aesthetically-pleasing design is ideal for a variety of enterprise and hotspot environments including hotels, schools, retail outlets, branch offices and public venues. Features of Zone Flex 7363 are:


**Fig 2: Zone-Flex 7363**

## *2.3.1 Best in class mid range performance and cost effective:*

- Concurrent dual-band (5GHz/2.4GHz) support.
- 600 Mbps of theoretical maximum speed
- Adaptive antenna technology.
- Advanced RF management.

## *2.3.2 Adaptive antenna technology and Automatic Interference mitigation:*

- Up to-4-times-extended range and coverage.
- Automatic interference mitigation, optimized for high-density environments.
- Integrated smart antenna array with over 300 unique patterns for high reliability.
- Physical antenna gain of 6 dB.
- Up to an additional 4 dB Beam Flex gain and 10 dB interference mitigation.

### *2.3.3 Concurrent support for video, VoIP and data:*

- Four queues per client station.
- Delivers 20 concurrent voice calls, 100 simultaneous data users per radio.
- Automatic prioritization of VoIP and video traffic.

### *2.3.4 Smart meshing increases flexibility, reduces costs:*

- Smart Mesh Networking.
- Admission control/load balancing.

### *2.3.5 Differentiated services with multiple SSIDs:*

- 8 BSSIDs per radio with unique QoS and Security policies.
- WEP, WPA-PSK (AES), 802.1 X support.
- Zero-IT and Dynamic PSK.
- Captive portal and guest accounts.
- RADIUS and Active Directory support.

## *2.4 Zone-Flex 7321:*

SMART DUAL-BAND SELECTABLE 802.11n ACCESS POINT Unmatched Price/Performance in a Dual-Band 802.11n Enterprise Access Point the Zone-Flex 7321 is the industry's most affordable dual-steam entry-level 802.11n access point. The Zone-Flex 7321 is designed primarily for emerging markets and single AP deployments where the demand for

mobile Internet services is rising but also where tighter economic constraints dictate a balance toward lower cost over sheer performance.


**Fig 3: Zone-Flex 7321**

## *2.4.1 Best price/performance of any entry-level AP:*

- The Zone-Flex 7321 offers the industry's best price/performance of any entry-level AP in its class.
- Making it ideal for single AP deployments.
- SMB requirements and emerging countries where high-capacity/value are essential.

### *2.4.2 Channel Fly for optimal wireless performance:*

- The ZoneFlex 7321 uniquely supports an innovative approach to automatic channel selection called Channel Fly.
- A capacity-driven approach to auto channel selection based on observed channel traffic.
- Channel Fly uses statistic modeling to learn and select the best performing RF channel.
- It relies on actual capacity on all channels across both 2.4 and 5 GHz frequencies to automatically move clients (using 802.11h) to a better channel with less interference and more capacity.

### *2.4.3 Simplified user security with Dynamic PSK:*

- With the Zone Director, the ZoneFlex 7321 radically simplifies Wi-Fi security for users and IT administrators through the use of Dynamic Pre-Shared Keys.
- Once users successfully authenticate, a unique pre-shared encryption key is generated and automatically installed on the user's device — along with the requisite SSID.
- This eliminates the tedious configuration of wireless settings and eases the burden of installing the same PSK (that could be easily compromised) on every user device.

### *2.4.4 Differentiated services with multiple SSIDs:*

- Up to 8 discrete SSIDs are supported within the Ruckus Zone-Flex 7321, each with unique broadcast, QoS, security and management parameters.

- Up to 2,048 discrete WLANs can be created and mapped to the same or different AP or VLAN.

- This lets hot-zone operators easily offer tiered services to different users or traffic types. Enterprises can use this feature to differentiate guest, contractor and employee access policies or to segment different traffic types.

### *2.4.5 Advanced WLAN applications with Smart/OS:*

- With the Ruckus Zone-Director Smart WLAN controller, the Zone-Flex 7321 supports a wide range of value-added applications such as guest networking, smart Wireless Meshing, Dynamic PSK, hotspot authentication, wireless intrusion prevention and many more.
- WLANs can be grouped and shared by specific APs.
- In a centrally managed configuration, the Zone-Flex 7321 works with a variety of authentication servers such as AD, LDAP, and RADIUS.

### *2.4.6 High performance hot spots:*

The 7321 uniquely supports the WISPr protocol to provide universal authentication method or UAM (browser-based login at a captive portal), walled garden, time-based user session control, and additional RADIUS attributes for hotspot service settings.

## *2.5 Zone-flex outdoor Access Point:*

Zone-Flex outdoor access points uniquely combine adaptive antenna technology and adaptive meshing to enable a new level of outdoor performance at a low cost. Built to withstand

the harshest of outdoor conditions, they're designed with the flexibility to function as standalone APs or as managed devices, using the same wireless controller as their indoor Smart Wi-Fi counterparts. If no Ethernet cabling is available, the outdoor AP meshes seamlessly with the indoor access points. Unprecedented 802.11ac Wave 2 performance enables extremely fast connections up to 1733 Mbps (5 GHz) and 800 Mbps (2.4 GHz). Unlike other outdoor Wi-Fi device today, it provides advanced interference mitigation to ensure the highest resilience for both client and inter-node mesh connect.

## *2.6 Zone-flex 7762:*

One of the first concurrent, dual-band (2.4/5 GHz) outdoor 802.11n access points, the Zone-Flex 7762 is in a class by itself. Ideal for enterprises looking to extend their wireless network outdoors or service providers that want to build multimedia hotspots and offload bulky data traffic from 3G networks, the Zone-Flex 7762 delivers one of the industry's highest performances at range.

**Fig 4: Zone-flex 7762**

### *2.6.1 Integrates Beam-Flex™ Smart Antenna Technology:*

- Enables consistent, high performance, extended coverage and multimedia support
- Automatic RF tuning adapts to constant changes in the environment with no client configuration needed
- Minimizes *inter*-nodal hops that degrade performance
- Results in fewer APs, more satisfied users

### *2.6.2 Provides Enormous Areas of Coverage:*

- Perfect for outdoor pool areas at hotels and resorts
- Ideal for schools, stadiums, and other outdoor sports facilities
- Excellent for enterprises that have shipping docks and other outdoor areas
- Automatic interference mitigation, optimized for high-density environments

### *2.6.3 Hardened enclosure for harsh outdoor environments:*

- IP-67 water and dust proof plastic enclosure with flexible wall, pole or ceiling mounting options ensures that no distortion of WiFi signals is introduced
- Built-in heater for cold climate (-40° C)
- Two external N-type antenna connectors
- Standard 802.3af/at Power over Ethernet (PoE), Ruckus custom high power PoE injector included, standard 802.3af output for surveillance camera

### *2.6.4 True Plug-And Play Multimedia Wireless LAN (WLAN) with Unmatched Ease of Use:*

- Quality of Service technology provides 4 queues per client station
- Web-based wizard supports configuration by non-wireless expert through Zone-Director
- Secure, sophisticated WLAN can be created in minutes
- No RF tuning or client configuration needed

### *2.6.5 Differentiated services with multiple SSIDs:*

- Up to 16 BSSIDs with unique QoS and security policies can be configured
- Enables hot-zone operators to easily offer tiered services to different user or traffic types
- Enterprises can differentiate guest, contractor, and employee access policies or segment different traffic types
- Captive portal and guest accounts

## *2.7 Zone-Director 1100:*

The Ruckus Wireless Zone-Director 1100 is Ruckus' centrally managed Smart Wireless LAN (WLAN) system developed specifically for small-to-medium enterprises (SMEs) and hot zone operators.

With simplicity and ease of use in mind, the Ruckus Zone-Director 1100 is purpose-built to address the gap between standalone, feature-deficient access points (APs) that must be individually managed and the costly, complex high- end enterprise systems that are overkill for most small business environments.


**Fig 5: Zone-Director 1100**

The Ruckus Zone-Director is ideal for small businesses that require a robust and secure WLAN that can be easily deployed, centrally managed and automatically tuned.

The Zone-Director 1100 is also perfect for operators who want to offer business class hotspot services such as voice over Wi-Fi, IP-based video, secure enterprise access and tiered Wi-Fi services in venues such as hotels, airports, schools and public buildings.

The Zone-Director 1100 integrates the Ruckus Smart/OS application engine that delivers advanced features such as smart wireless meshing, high availability, hotspot authentication, elegant guest networking and dynamic Wi-Fi security.

# Chapter 3

# Deploy of Wi-Fi

# Network

## *3.1 Deploy of Wi-Fi Network:*

As more Wi-Fi capable devices enter the market the average number of devices in any given area of a network increases. In the case of extremely dense venues such as stadiums or Large Hotel, these very dense populations can introduce significant stress on the network and require specific design considerations. There are a number of factors that can impact a very high density environment, including:

- Performance requirements
- Number and density of APs
- Number and density of clients
- Wi-Fi capabilities of clients
- Current RF environment
- AP hardware
- AP mounting

Each of these conditions can potentially cause severe network degrade.

### *3.1.1 Site Visit:*

First physical visit to the site to determine:

- Walkthrough of coverage areas
- Confirm accuracy of received documentation
- Confer with venue representative on places that cannot be used for mounting positions and other potential issues
- Gather additional intelligence, where are the VIPs and what type of events occurring there. What type of events would need special wireless services or to have the Wi-Fi turned off because of exhibitors equipment running on same frequencies.

### *3.1.2 Network Design:*

All of the information previously gathered is used to do a simulation of the venue. This is used to create an initial design including:

- Bill of materials (BOM) for the wireless network
- BOM for supporting equipment (wired network build-out, conduit, wire hangers, etc.)
- Installation locations for equipment
- Hardware/workers required for installation (cherry pickers, etc.)
- Estimated coverage and capacity report.

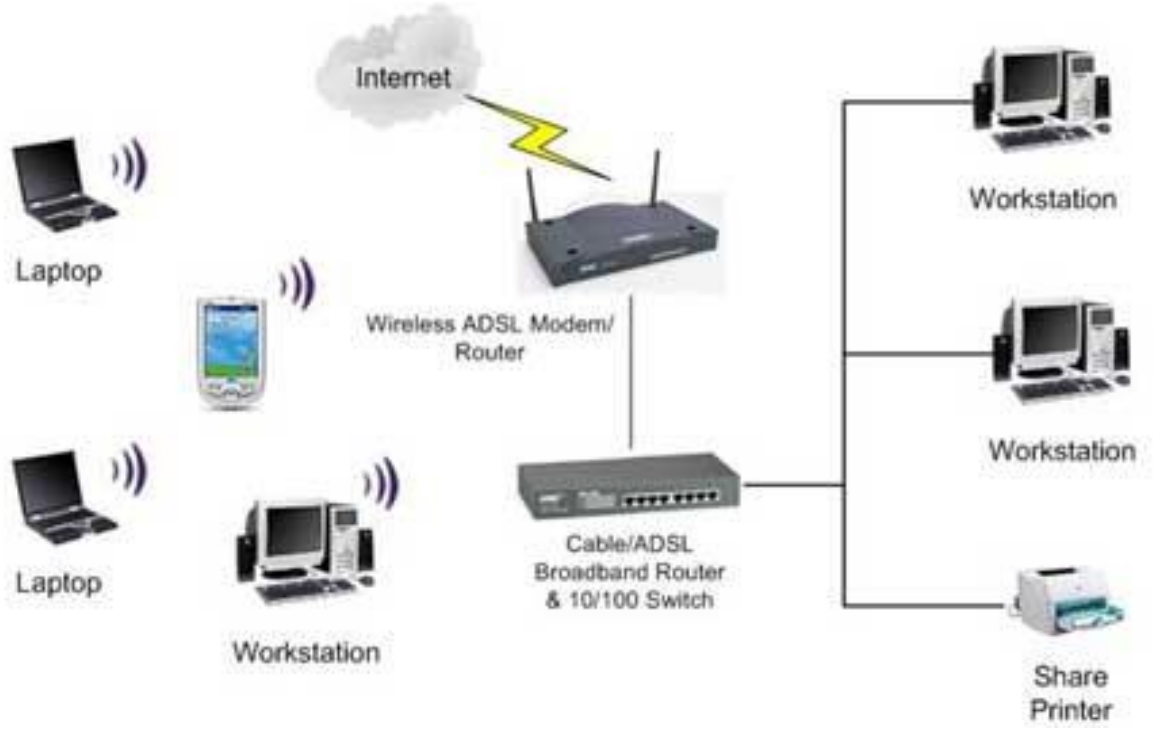


**Fig 6: Wi-Fi network Diagram**

### *3.1.3 Device Configuration:*

This step is totally technical. In this step at first all the devices (access points) are configured with the provided IP addresses by the Hotel's IT person. To configuring the Access point, the AP (access points) needs tube connected with a computer. Then the IP address of the computer has tube changed and need to set one of IP address of AP's IP series. Thereafter it is needed to open up a Browser and log into the AP by hitting with the AP's IP address. Then customize the network setting and have to save-it.

- **Gateway:** 192.168.2.1
- **Primary DNS Server:** 208.67.222.222
- **Secondary DNS Server:** 208.67.220.220
- **NTP Server**: ntp.ruckuswireless.com
- **Connection Status:** Up
- **Connection Type:** dhcp
- **MAC Address:** 00:24:82:26:43:aO
- **IP Address:** 192.168.2. 103
- **Mask:** 255.255.255.0
- **DHCP Actions: Renew DHCP Release DHCP**

### *3.1.4 RF Survey:*

Once the equipment is installed, the design model is verified against the deployed environment. This step consists of a follow-up visit to site to conduct actual RF testing and initial design validation.

### *3.1.5 Final Step:*

At first a connection from the Core router is taken to the Core Switch, where a server and the Zone Director are connected. The server was Linux Based DNS, WEB, Mail, proxy server. A connection from the core switch will go to the aggregation switch from where the connections for the PoE(power over Ethernet) switch will served and from there for every connection the Access points are supplied

# Chapter 4

## *4.1 Conclusion:*

This Internship provides the opportunity to test interest in a particular career before permanent commitments are made. It gave me proper scope to gain experience and knowledge which co-relate with the theoretical background that we learned in university courses. In FONS Bangladesh, working with the vendor like RUCKUS Wireless gave me the practical as well as technical knowledge of Wi-Fi technology. In FONS Bangladesh I have learned bow to survey a site, to provide them appropriate solution about Wi-Fi and how to deploy a new Wi-Fi network. Experience of this internship will help me to make a better carrier in telecommunication field. I also learned new concept and new way of working. I have learned how to work in a team, and I often needed to meet expert person to resolve some problems. I surprise this whole experience such as network monitoring, survey and field operation has been very helpful for my future life.

# List of References


| Reference | Reference Details |
|---|---|
| 01 | https://en.wikipedia.org/wiki/Wi-Fi |
| 02 | https://en.wikipedia.org/wiki/Wi-Fi#History |
| 03 | http://wireless.ece.ufl.edu/jshea/HistoryOfWirelessCommunication.html |
| 04 | http://techterms.com/definition/wi-fi |
| 05 | http://www.elprocus.com/how-does-wifi-work/ |
| 06 | http://www.webopedia.com/DidYouKnow/Computer_Science/wireless_networks_explained.asp |
| 07 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11.php |
| 08 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11a.php |
| 09 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11b.php |
| 10 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11g.php |
| 11 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11n.php |
| 12 | http://www.radio-electronics.com/info/wireless/wi-fi/ieee-802-11ac.php |
| 13 | http://www.ruckuswireless.com/products/access-points/zoneflex-indoor/zoneflex-7363 |
| 14 | http://www.ruckuswireless.com/products/access-points/zoneflex-indoor/zoneflex-7321 |

| | |
|---|---|
| 15 | http://www.ruckuswireless.com/products/system-management-control/zonedirector-controllers |
| 16 | http://www.thesuitmagazine.com/technology/web-a-internet/22360-wireless-revolution-the-history-of-wifi.html |